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**DIVISION OF ENGINEERING SERVICES**  
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## METHODS FOR TESTING MACHINE MIXED, TWO-COMPONENT, TYPE A SEALANTS

**CAUTION:** Prior to handling test materials, performing equipment setups, and/or conducting this method, testers are required to read "**SAFETY AND HEALTH**" in Part 8 of this method. It is the responsibility of the user of this method to consult and use departmental safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

### A. SCOPE

These test methods describe procedures for evaluating two-component, polyurethane and silicone joint sealants used for filling joints in concrete structures where movement occurs.

This test method is divided into the following parts:

1. Mixing and Preparing Samples
2. Modulus at 150 % Elongation
3. Recovery
4. Notch Test
5. Water Resistance
6. Ultraviolet Exposure
7. Cone Penetration
8. Safety and Health

### PART 1. MIXING AND PREPARING SAMPLES

#### A. APPARATUS

1. Concrete test blocks 1 by 2 by 3 inches fabricated according to California Test 413. Blocks purchased from the Masonry Test Block Co. in Saginaw, Michigan have also proven to be satisfactory.
2. Various sizes of Teflon spacers; ½ by ½ by 2 inches, ½ by 1¼ by 2 inches and ½ by 1 by 2 inches.

3. Forced air oven able to maintain a temperature of  $70 \pm 2^{\circ}\text{C}$ .
4. Six-ounce seamless tin ointment containers shall have an approximate diameter of 4 inches and approximate height of 1.5 inches.

### B. TEST PROCEDURE

1. Combine the volumes recommended by the manufacturer of the two component sealant so that the total volume is a pint or less. Vigorously mix these materials for 45 s with an air powered stirrer fitted with a mixing blade. During the mixing, incorporate as little air as possible. Within 30 s after final mixing, pour the samples into the prepared molds described below. Do not scrape the sides of mixing vessel. More than one mix may be required to prepare all specimens.

If the sealant comes in a side-by-side cartridge, use the static mixing nozzle provided by the manufacturer to prepare the samples below.

2. If required, prime the surfaces of the 1 by 2 by 3-inch concrete test blocks with primer furnished by the sealant manufacturer. Prepare six ½ by ½ by 2-inch specimens of sealant using Teflon spacers. The 2-inch sides of the

sealant shall be centered and parallel to the 2-inch side of the test block. After 24 hrs at  $25 \pm 1^\circ\text{C}$ , place test specimens in an oven at  $70^\circ\text{C}$  for 7 days. Condition the samples for 8 hrs at  $25 \pm 1^\circ\text{C}$  before testing.

3. Using a form, cast a smooth sheet of sealant 0.125 inches thick against a sheet of plastic. Cure the sample for 24 hrs at  $25 \pm 1^\circ\text{C}$ , followed by 48 hrs at  $70^\circ\text{C}$ . Cut a tensile test specimen as described in California Test 434.
4. Fill a 6-ounce ointment can with the mixed sealant. Let cure 24 hrs at  $25 \pm 1^\circ\text{C}$ .

## **PART 2. MODULUS AT 150 % ELONGATION**

### **A. APPARATUS**

1. Tensile testing apparatus capable of measuring at least 100 lbs force and with grips able to hold and test the concrete test blocks.

### **B. TEST PROCEDURE**

1. Place the specimen conditioned at  $25^\circ\text{C}$  in the suitable tensile testing machine.
2. Extend the specimen, at the rate of 0.2 inches per min, to a width of 1.25 inches (150 % extension).
3. Record the stress at 150 % extension in pounds per square inch. The modulus is the average of two stress determinations.

## **PART 3. RECOVERY**

### **A. TEST PROCEDURE**

1. After the modulus determination, insert the 1¼-inch spacers between the concrete blocks to maintain 150 % extension. Condition the specimens for 7 days at  $25 \pm 1^\circ\text{C}$ .

2. Remove the spacers and place the test specimens on a glass surface so that the two 1 by 3-inch surfaces of each specimen bear directly on the glass. At 2-, 3-, and 5-min intervals, lift the test specimen carefully to help relieve any friction that may restrict the recovery of the sealant.
3. Measure the width of the sealant (the distance between the 2 inch by 3-inch face) of the blocks 5 min after relaxation.

## **PART 4. NOTCH TEST**

### **A. APPARATUS**

1. Razor blade marked to a depth of 1/16 inch.

### **B. TEST PROCEDURE**

1. Extend the test specimen to 1¼ inches, insert the 1¼-inch spacers, and cut a notch 1/16 inch deep, parallel to the 3-inch block dimension and across the center of the sealant surface.
2. Examine the sealant 24 hrs later for the extent of failure in cohesion or adhesion.

## **PART 5. WATER RESISTANCE**

### **A. TEST PROCEDURE**

1. Extend two specimens 100 % to 1 inch. Insert the 1-inch spacers and immerse the specimens in de-ionized water at  $25 \pm 1^\circ\text{C}$  for 7 days.
2. Observe for tearing or loss of adhesion. Record the elapsed time when a tear or loss of bond exceeds ¼ inch.

## **PART 6. ULTRAVIOLET EXPOSURE TEST**

### **A. APPARATUS**

1. An accelerated weathering apparatus as described in ASTM Designation:

G154. The test cycle is described in Table X2.1, Cycle 2.

2. A jig that will extend and hold the center of the tensile specimen from 1 inch to 2 inches (100 % elongation of the center section).

## **B. TEST PROCEDURE**

1. Place the tensile test specimen in the jig and extend the center portion 100 %.
2. Mount this jig in an Accelerated Weathering Cabinet and test for 200 hrs.
3. After 200 hrs of exposure, the specimen shall exhibit no more than slight cracking or checking.

## **PART 7. CONE PENETRATION**

### **A. APPARATUS**

1. Penetrometer with a grease cone attachment as described in ASTM Designation: D 217.

### **B. TEST PROCEDURE**

1. Using the sample poured into the 6-ounce tin, test as specified in ASTM Designation: D 217.
2. Make three tests for penetration on the surface of each sample at points not less than  $\frac{3}{4}$  inch apart and  $\frac{3}{4}$  inch from the edge of the container

## **PART 8. SAFETY AND HEALTH**

This method may involve the use of toxic chemicals, including isocyanates. Review the Material Safety Data Sheet before handling the product. Wear an approved respirator and work in an exhaust hood whenever possible. Eye protection and gloves should be worn. When curing specimens in an oven, be sure to provide adequate ventilation around the oven or place the oven in an exhaust hood. Observe good hygiene

practices. Wash hands after handling samples and before eating, drinking or smoking.

Prior to handling, testing or disposing of any sample, testers are required to read the Caltrans Laboratory Safety Manual. This manual contains information on general safety principles, standard operating procedures, protective apparel, disposal of materials and how to handle spills, accidents, emergencies, etc. Users of this method do so at their own risk.

### **REFERENCES:**

California Tests 413 and 434  
ASTM Designations D 217, G 154  
Caltrans Standard Specifications and Caltrans  
Laboratory Safety Manual

End of Text

(California Test 435 contains 3 pages)